Smart Sampling

# Section 9

*Very Preliminary*

**Summary**

Smart Sampling

## Assumptions

*Probabilistic Approach*

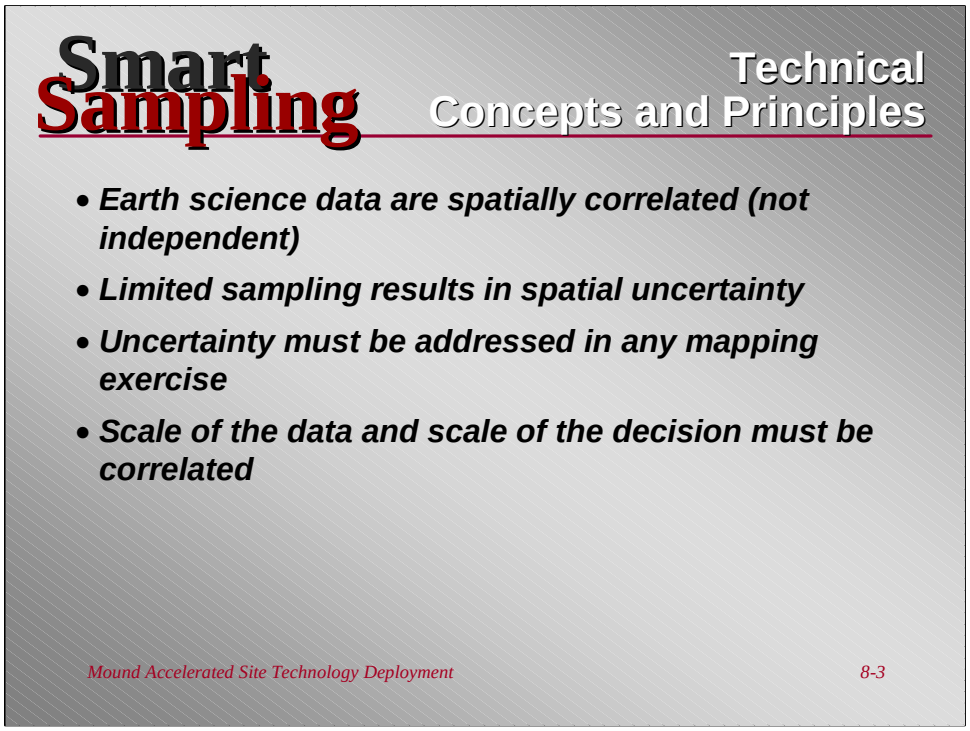
- Uncertainty is acknowledged in Decision Rule
- Demonstrated spatial correlation of site data is basis of mapping

*Economic Framework*

- Projects are framed as Optimization / Minimization problems and solved as Decision-Analytic Problems
  - All factors are given a $ value (costs, risks, consequences)

*Collaborative Partnership*

- Site Owners, Regulators, Stakeholders, Project resources
- Performance Objectives negotiated among all parties
- Information open to all parties

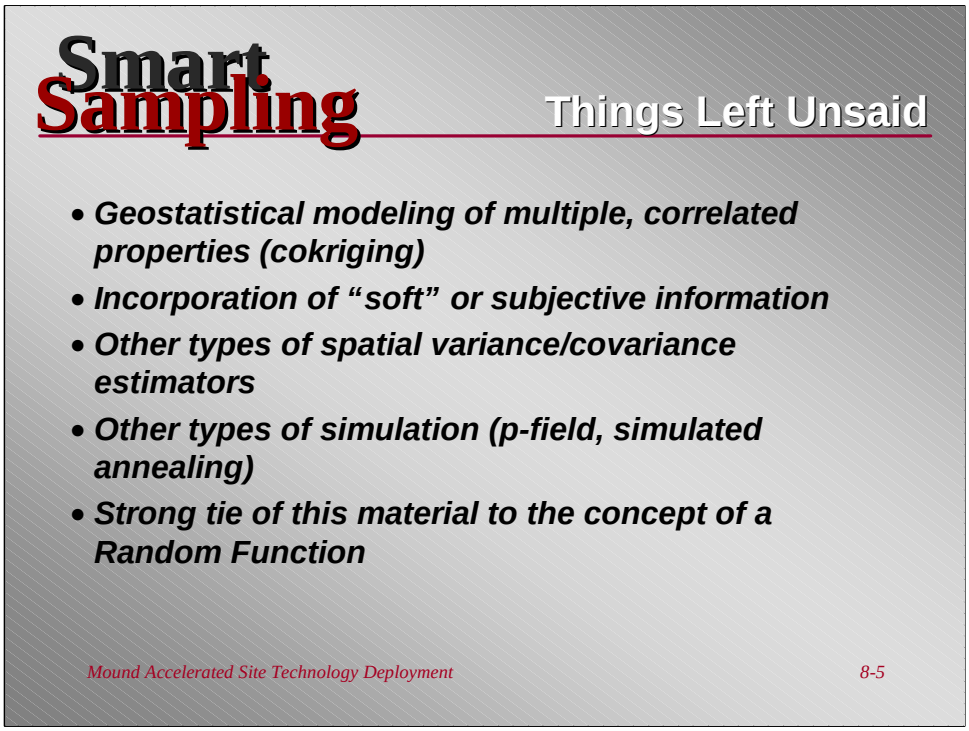



If the action level is the mean, the proportions don't change much; and if the action level is below the mean, the proportion of remediation blocks above the action level will increase as the scale increases.

Smart Sampling

## Application Concepts and Principles

- *Objective, Defensible Decision Framework*
- *Probabilistic Decision Rule*
- *Values Expressed in Economic Terms*
- *Collaborative Decision Process*
- *Open Access to Information*



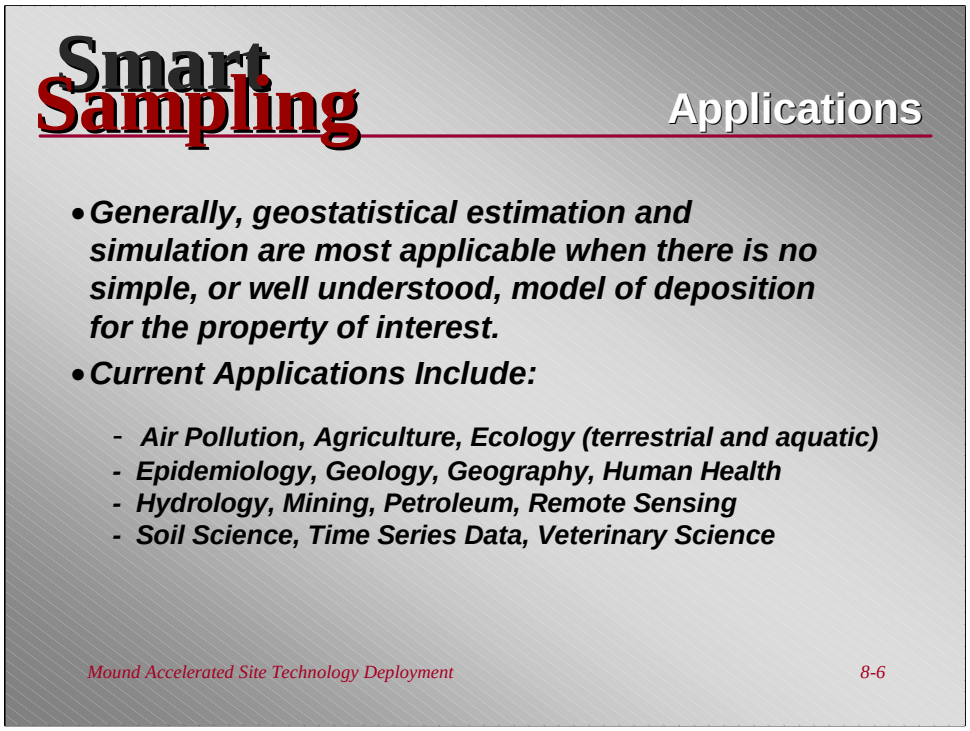

The site in this example is 2200 m x 2200 m. Composite samples were taken on 10 x 10m blocks. The concentrations were averaged to make a decision on 20 x 20m or larger blocks.

As the decision blocks get larger to 50 x 50m and 100 x 100m, the picture gets smoother. Focusing on the hotspots when making a decision on the 100 x 100m scale is not very efficient.

If the action level is 25 pCi/g (the top of the color bar), quite a bit of area in 10x10m or 20x20m blocks must be remediated, but if the decision scale is 100x100m hardly any remediation needs to be done.

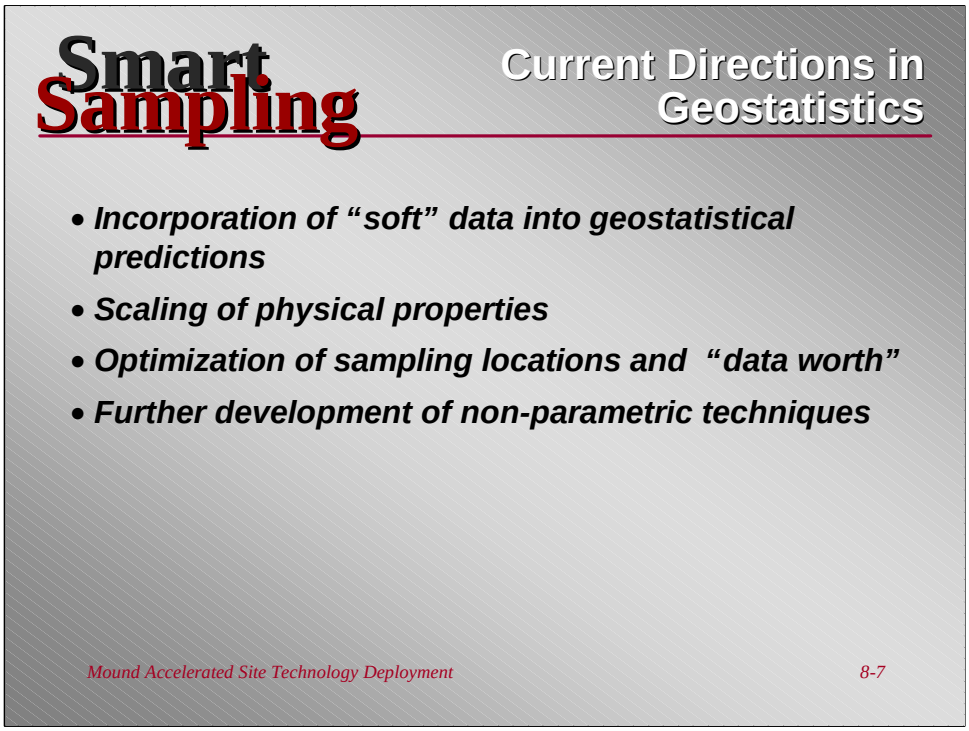
The action level is also a function of scale. Does it apply to the teaspoon, the bulldozer, or the subdivision?

There is no one answer to this. Scaling is something you have to keep in mind when you're doing sampling, and it should be worked out with the regulators and the stakeholders.

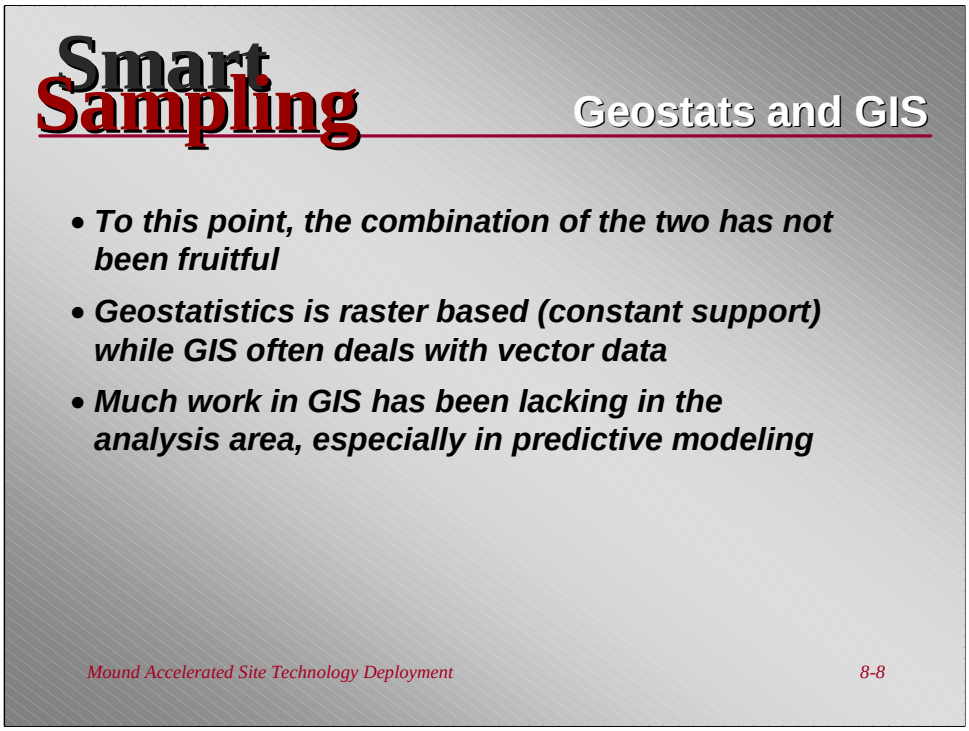



We have been looking at data sets that are well behaved in terms of samples being taken over the same scale that the decision is being made. That is not always the case. Often, or even usually, measurements from a sample size of a few centimeters of soil are used to make a decision over a 50 or 100 sq. ft. area. We don't have samples and decisions at the same scale.

This section addresses how we mediate between those scales.




Scaling is a smoothing process. As we average over bigger and bigger block sizes, the mean value does not change but the standard deviation goes down. There is not as much variability as we smooth towards the mean. The minimum value increases and the maximum value decreases.




The proportion of the site that requires clean-up drops as the discretization size increases.

The proportion of the distribution that is above 15 ppm is dropping because the action level is above the mean. As we average up, things tend to collapse to the mean (the average of the whole domain is the mean value).

Remediation panel size and action level are fundamentally linked.